country, it may be worth while noting that it does not show the total humus, but only the humic acids. Berthelot has, in fact, shown that even boiling with potash leaves a considerable part of the organic carbon and nitrogen of a soil undissolved.

English agricultural writers employ two names for *Beta vulgaris*—"mangel" and "mangold"; Mr. Ingle employs the latter. The former spelling is, however, more correct. The word comes from the German description "Mangel-Wurzel," or scarcity root, alluding to its resistance to drought. The spelling has probably drifted into mangold from the golden colour common to the roots. R. W.

*Ueber Aehnlichkeiten im Pflanzenreich.* By F. Hildebrand. Pp. iv + 66. (Leipzig: W. Engelmann, 1902.) Price 1*s*. 9*d*. net.

PROF. HILDEBRAND, in his introductory remarks, takes exception to the use of the term "mimicry." He states that it is applied by zoologists when two very different animals show similar appearances which are of apparent benefit to one, and that the explanation of zoologists infers that these similarities are developed in the struggle for existence. The latter part of this statement is distinctly misleading, as it is doubtful if any zoologists regard such similarities as being developmental. The object of the book is to show that in the plant world mimicry rarely if ever occurs, and that similarities in plants or plant forms are mainly due to environment or ecological factors. The series of comparative sketches which Prof. Hildebrand has published form light reading, but they might with advantage have been worked up in greater detail.

*Index to the Literature of the Spectroscope* (1887–1900, *both inclusive*). By Alfred Tuckermann. Pp. 373. Continuation of the previous index by the same author published in 1888. (Published by the Smithsonian Institution, 1902.)

IN the previous index, extending from the dawn of spectroscopy (or even earlier, for references are made to papers published in the seventeenth century) to 1886, the author arranged the books and papers under 320 different sections, placed alphabetically. In each section the titles of the papers, the authors' names, and references to the original papers and abstracts are arranged in the alphabetical order of the authors' names. The present contribution is divided into two parts, part i. being an authors' index extending to 188 pages, in which the authors' names are placed alphabetically and the full title, year of publication and references to the papers and abstracts are given; and part ii. a subject-index beginning with history, books, spectroscopy in general, followed by nearly 300 divisions arranged alphabetically. In these divisions the authors' names are first given alphabetically, followed by the references to the papers with the year of publication, but without any reference to the titles or to contents of the papers which are not given in the titles. Thus under titanium there are five references; the first is in the *Wiener Anzeiger*, and does not appear in the author-index, the second is on ultra-violet spark spectra, the third on titanium as a comparison spectrum, the fourth on the arc spectrum, and the fifth on the shifting of the arc spectrum lines under the influence of pressure. The value of the index would have been enormously increased if the papers had been arranged alphabetically according to the subjects, and with the papers on the same subject placed in order of date instead of according to the authors' names. Such a system would have entailed more printing, but it would not have caused very much more work in preparation and would certainly have been worth the additional trouble.

The list appears to be very complete; it may be said to be more than complete, for some of the papers indexed do not deal with spectroscopy. Thus five papers on meteors which we have examined do not contain any reference to spectra, and one on the yellow variety of arsenic does not deal with spectroscopy; several papers are indexed which contain only micrometric measurements of the diameters of planets. It is perhaps ungracious to criticise in this manner a work which must have been very arduous to the author, but the inclusion of papers that do not refer to the use of the spectroscope may be the cause of much loss of time and trouble to workers, and this would not have happened if the subject-index had been prepared in the way above suggested.

Dr. Tuckermann must be congratulated on the conclusion of his work, which, notwithstanding the defects which we have mentioned, cannot fail to be of service to many investigators in this important branch of science. H. M.

## LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

### Misuse of Coal.

NATURE of March 20, containing a most interesting communication by Prof. John Perry on the "Misuse of Coal," has reached me lately. Surely Prof. Perry takes an insular view of the matter. Like so many Englishmen, alas! he knows not the forest! The greater portion of the world cooks its food and makes itself comfortable on wood fuel, and though all the forests in the world would, according to European ideas, be inadequate to supply by their growth the present expenditure of coal (their fossilised remains), to overlook altogether the sun power which we can fix by growing wood fuel is surely, from even a European point of view, an oversight. Helmholtz compared the number of thermal units received by an acre of land in Germany during a year with the number of thermal units produced by burning the vegetable matter elaborated during a year. His calculation was that only the 1/1477th part of the sun's heat was thus rendered available.

On this basis it is possible roughly to calculate the maximum thermal efficiency as firewood of the wattle or Eucalyptus vegetation on the coast of Australia or South Africa. (Insolation is for the latitude somewhere about one-sixth greater at Cape Town than in mid-Germany; practically it is more on account of the clearer atmosphere.) The production of firewood is about five times as much; thus, taking Crottondorf as an example of a European forest giving one of the largest yields in timber, we have:—

Crottondorf spruce, mean yearly yield 143 cubic feet.
Quick-growing Eucalypts, S. Africa, do. 700 ,,

Or the maximum South African yield is five times the maximum European yield. But since the average weight of eucalypt wood is three times that of spruce, the heating power produced on an acre of Eucalypts must be set at about fifteen times that produced on an acre of northern and mid-European forest. Thus on the basis of Helmholtz's calculation a eucalypt plantation can, with the most favourable circumstances, in South Africa or on tropical mountains, store up, say, 15/1500 = 1 per cent. of the solar energy received on the unit of area.

The position in Cape Town to-day is that it is cheaper to plough the ground and plant a forest of quick-growing trees than to import coal from over the sea or by a long and expensive land journey. Firewood in Cape Town is worth nearly 1*s*. per cubic foot, and before the railway was extended to the diamond fields firewood there has fetched 1*d*. per lb., the price at which sugar has been retailed in England. No doubt from a British insular point of view coal at 2*l*. or 3*l*. per ton is a terrible misfortune. It certainly increases the cost of running machinery; but if this does not take place to a prohibitive extent, and if it makes the user of power careful not to waste it, it is not an unmixed evil. And if thereby afforesting is made a paying operation, it is at least open to discussion whether dear coal and good forests would not be better for England than an expenditure of 23,000,000*l*. sterling on

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imported timber, and the evils, including physical degeneration of the race, and coal fogs in the big cities, which have been shown elsewhere to result from England's neglect of its forests. The reference to De Wet in Prof. Perry's communication is unfortunate: a small quick-moving army would probably have caught him. And surely cheap coal and luxury is not the *summum bonum*. Rather let us have hamlets of strong forest workers than the luxurious town dwellers of to-day with their decayed muscle and cheap mechanical power! Compare a European engine-driver with the runner castes of India and Japan. The engine-driver shows us perhaps fine inherited muscle, but going to decay for want of use; the Eastern runners show the development of muscle by both use and inheritance. Which would have the best chance of catching De Wet a hundred years hence?

As far back as 1882 the discovery was made by Sir D. Brandis and myself that Eucalypts planted on tropical mountains will produce wood fuel at the rate of 20 tons (dry weight at 60 lbs. per cubic foot) per acre per year in perpetuity. The eucalypt plantation reproduces itself when cut, without further expense, and its dry timber, heavier than coal (which, as met with commercially, weighs 50 lbs. to 52 lbs. the cubic foot) has an equal or a higher thermal power, bulk for bulk, than coal. We obtained this result as the maximum yield of *Eucalyptus globulus* on the Nilgiris, Southern India. No doubt there are other instances where higher yields are produced now, and no doubt also when the coal supply is exhausted, selection and experiment will produce a forest vegetation that will produce more than 20 tons per acre per year. The sugar beet and all the fruits and vegetables of civilisation show how the vegetable kingdom can be moulded to suit man's wants. If a chance tree on a chance mountain in a chance soil can produce the equivalent of 20 tons of coal per acre per year, it seems not unreasonable to suppose that by selection we can produce, say, double this, or 40 tons. To produce this in perpetuity we should probably have to find a tree with the moderate soil requirements of the Conifers. A powerful sun, a heavy rainfall, and a very rapid forced growth would be the essentials of such a production of wood fuel.

Looking at a rainfall map of the world, one sees that these conditions are fulfilled over about 8000 million acres of its surface (which is between one-fourth and one-fifth of the total land surface of 35,200 million acres). I take latitudes below 40° and rainfalls above 40 inches. One-half of this area under forest might thus yield the equivalent of 161,000 million tons of coal yearly. This is more than 288 times the world's present consumption of coal, assuming that coal and eucalypt timber are of approximately equal heating power. On the basis of the actual forest yields of to-day we have half this, or 80,500 million tons. In Germany, one-fourth of the total area is under forest, and this is held on the highest authority to be the suitable proportion for a thickly-peopled civilised country such as Germany. The forest should properly occupy a higher proportion in countries where large areas are pestilential and unsuited for human habitation. Putting this, however, aside, and taking the German standard of one-fourth forest, then on the basis of to-day's maximum yields we should obtain a yearly output of 40,250 million tons. And if to convert the maximum forest yield to an average forest yield we again divide by two, we obtain 20,175 million tons. Lower than this I do not think we can reasonably go for the class of forest under consideration. *It is a little more than thirty times the world's present consumption of coal.* The world's yearly output of coal recently was 663 million tons, says Prof. Perry.

Thus we see that the yield of firewood from the world's tropical and extra-tropical forests, whenever they are fully stocked and scientifically worked, will yield the equivalent of from thirty times to 122 times the present consumption of coal, or even up to 243 times the present consumption of coal if we succeed by cultivation in doubling present timber yield figures.

It may be objected that my figures are far in excess of those representing the yield of European forests and that they require confirmation. No doubt they are far in excess of European figures; but so also is the intensity of the vegetative process in these latitudes, and so also is the stature of the Sequoias of California, and the Eucalypts of Australia and South Africa above the stature of the biggest spruces and silver-firs of Europe. The Nilgiri figures I have quoted above were formally recorded in two official reports printed and published by the Madras Government in 1882.[1] They have since been confirmed by the measurements of forest officers who have subsequently had charge of the Nilgiri plantations. Similar figures have been obtained by myself and other forest officers in South Africa. They have been exceeded in several plantations in Natal, while at Johannesburg they have not been confined to Eucalypts, but have been obtained from *Acacia decurrens*, or black wattle, as well as from some other trees.

Therefore, "when our coal supply is exhausted, when all the races of the world have fought for the waterfalls and places of high tide," there will still remain that which Englishmen of all the civilised races of the world do most neglect—the forest.

D. E. HUTCHINS.

Grootvadersbosch, Swellendam, Cape Colony, May 14.

## Cold Weather in South Africa.

WE have been getting exceptional weather here of late. General French was actually snowed up at Middelburg. A good general idea of the circumstances will be obtained from the telegrams abridged below from the *Diamond Fields Advertiser* of June 14.

Middelburg (Cape), June 11.—For the first time for sixteen years the town is covered to a great depth with snow. Kingwilliamstown, June 11.—A fierce thunderstorm occurred last night, accompanied by heavy rain. Port Elizabeth, June 11.—The train service between Graaff-Reinet and Rosmead is to-day stopped temporarily owing to heavy snowstorms—an unusual experience for South Africa. Cradock, June 12.—An exceptionally heavy fall of snow occurred in the Midlands on Tuesday night and yesterday. Queenstown, June 12.—The rainfall reported during the first five months of the year is the lowest recorded for the same period for the past thirty years. The drought has, however, been broken. Rain started on June 10, and during the night there was a heavy fall of snow. Kokstad, June 12.—There was a heavy snowstorm last night, accompanied by a heavy gale. The snow is several inches deep in the streets. Bloemfontein, June 12.—The weather is unprecedentedly cold. The hills round Thaba 'Nchu are covered with snow. Last night snow fell in Bloemfontein.

At Kimberley it has been intensely cold, with a low barometer, wind, rain and sleet, and afterwards heavy frost. With the one exception of July 12, 1886 (when Kimberley is said to have been under snow for the whole day), the maximum shade temperature registered is the lowest on record. For the eight days ending Sunday, June 15, the temperatures have been:—

| | Observatory Screen. | | Stevenson Screen. | |
|---|---|---|---|---|
| | Max. | Min. | Max. | Min. |
| June 8 ... | 72°·0 | 34°·0 | 73°·7 | 33°·0 |
| ,, 9 ... | 59°·0 | 39°·0 | 59°·8 | 38°·1 |
| ,, 10 ... | 46°·2 | 38°·0 | 45°·9 | 37°·8 |
| ,, 11 ... | 45°·4 | 36°·9 | 44°·9 | 36°·1 |
| ,, 12 ... | 48°·3 | 31°·6 | 46°·8 | 31°·2 |
| ,, 13 ... | 52°·1 | 25°·2 | 53°·7 | 24°·2 |
| ,, 14 ... | 57°·0 | 26°·9 | 58°·0 | 26°·0 |
| ,, 15 ... | 62°·0 | 29°·0 | 63°·2 | 28°·0 |

The maximum temperatures registered on June 10 and 11 are the lowest on record for any June. The maximum registered on July 12, 1886, was 35°·8. There was also a maximum temperature of 45° in July 1891. Both, however, were obtained under a Glaisher screen and are probably a little too low. Minimum temperatures lower than 25° have been registered perhaps three times; the lowest known is probably 20° in July 1888. All these previous instances have been quite transitory, the temperatures in each case being much higher both the day before and the day after. There seems to be no record of a cold spell having the duration of the one in question.

Kenilworth, Kimberley, June 16. J. R. SUTTON.

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[1] "Suggestions regarding Forest Administration in the Madras Presidency," by D. Brandis, C.I.E., Inspector-General to the Government of India (Madras, 1882).

"Report on Measurements of the Growth of Australian Trees on the Nilgiris," by D. E. Hutchins, Dep. Cons. Forests, Mysore (Government Press, Madras, 1883).

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